Amateur Astronomers: MATCH GAME

INSTRUCTIONS

Goal

To collect the most pairs of cards
(A pair consists of one IMAGE CARD and one DESCRIPTION CARD.

Setup

Shuffle the cards and lay them face down in a pattern (e.g. 8 cards x 5 cards).

Playing the Game

On each turn, a player turns over two cards (one at a time) and keeps them if the IMAGE CARD matches the DESCRIPTION CARD. If they successfully match a pair, that player also gets to take another turn. When a player turns over two cards that do not match, those cards are turned face down again and it becomes the next player's turn.

Scoring for 1 player

Time yourself to see how fast you can find all of the matching pairs. Compete with yourself by trying to get a faster time in a second game.

Scoring for 2 to 4 players

Players keep each pair they find. At the end of the game, each pair scores one point.

Winning

When all the pairs have been found, the player with the most points wins.

DESCRIPTION CARD

Solar Prominence *NASA Skylab*

The Sun is a seething ball of extremely hot gas. Here, the Sun was captured by Skylab in 1973 throwing off one the largest eruptive prominences in recorded history. The Sun has survived for about 5 billion years, and will likely survive for another 5 billion. The Sun is not on fire, will never explode, and a solar flare will never destroy the Earth. The Sun continues to present many unanswered questions. For example: Why is the Sun's corona so hot? What causes the Sun's unusual magnetic field? Why does the Sun's center emit so few neutrinos?

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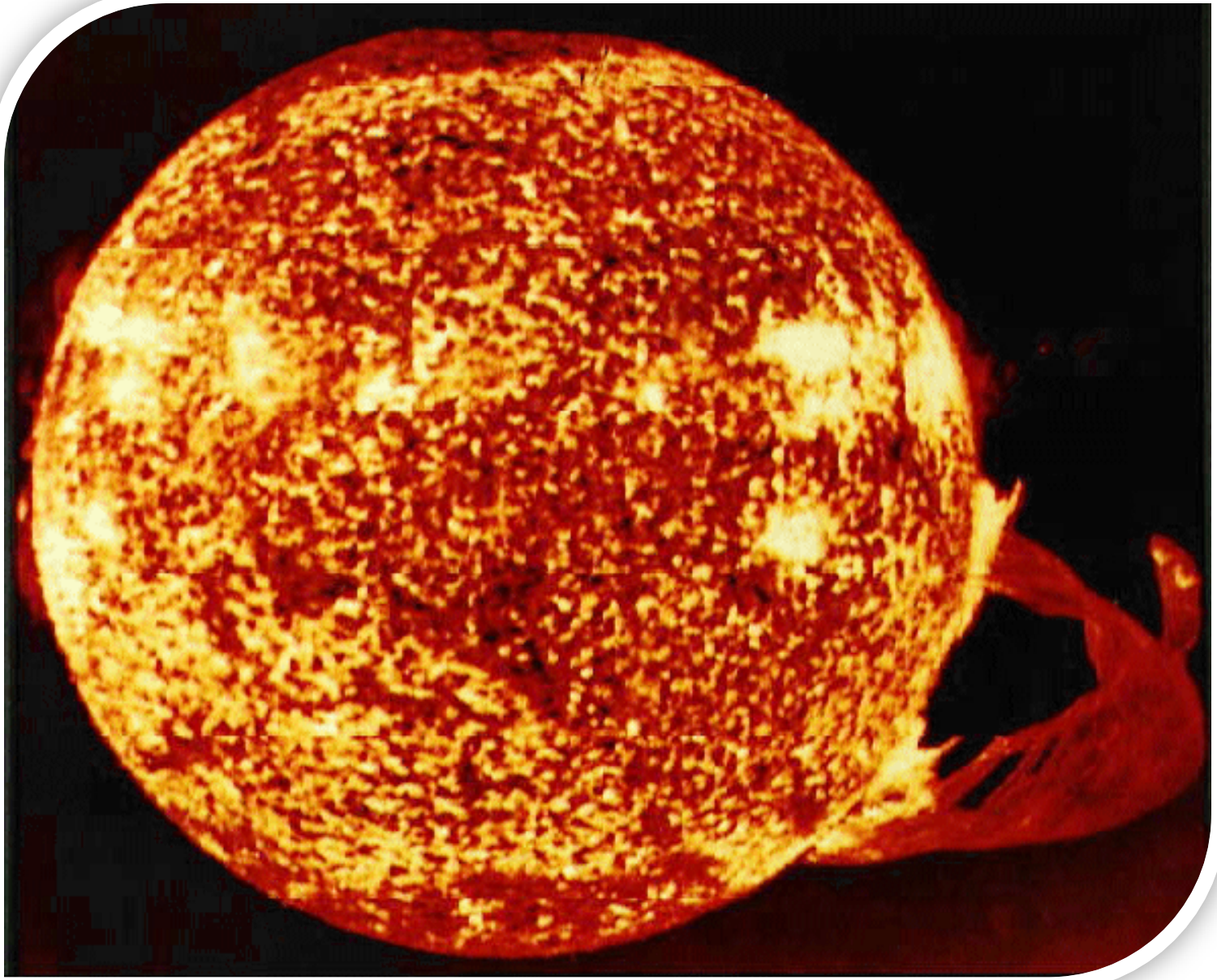
IMAGE CARD



DESCRIPTION CARD

Magnetogram *Stanford Solar Center*

A magnetogram is not a "picture" of the Sun which you might see with your eyes. Rather, it's an image taken by an instrument which can detect the strength and location of the magnetic fields on the Sun. In a magnetogram, grey areas indicate that there is no magnetic field, while black and white areas indicate regions where there is a strong magnetic field. (Any colors could have been chosen; the grey-black-white is just a common convention, or choice.) Magnetograms show "line-of-sight" magnetic fields (that is, those either coming directly towards us or going away from us). The darkest areas are regions of "south" magnetic polarity (inward directed, or moving toward the center of the Sun) and the whiter regions "north" (outward directed, moving toward us) polarity.

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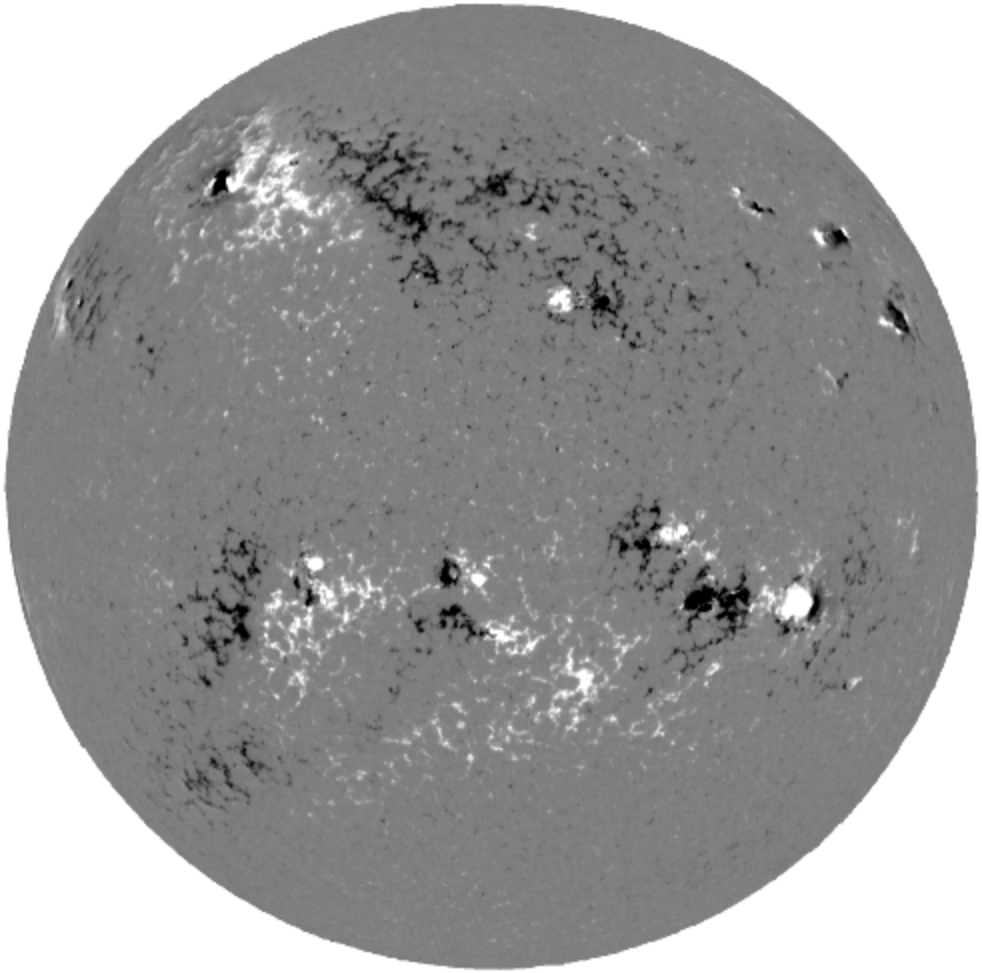
IMAGE CARD



DESCRIPTION CARD

SOHO Spacecraft *NASA*

On 2 December 1995, the **Solar and Heliospheric Observatory** (SOHO) was launched on board an Atlas 2AS rocket from Cape Canaveral, Florida. This European Space Agency (ESA) cornerstone mission is a joint venture with the National Aeronautics and Space Administration (NASA), to study the Sun, from its deep interior, through its atmosphere, out to the heliosphere, including the solar wind and its interaction with the interstellar breeze.

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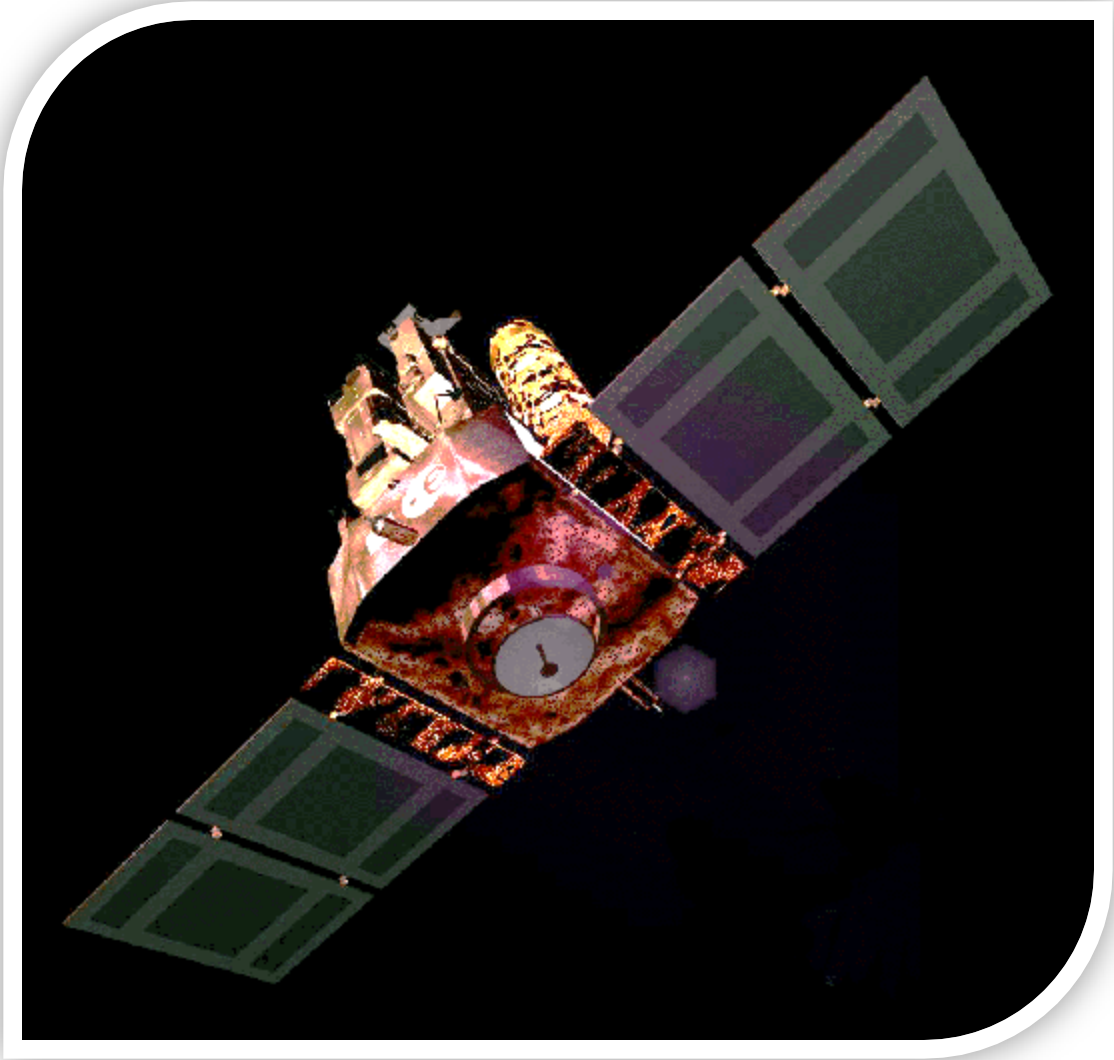
IMAGE CARD



DESCRIPTION CARD

Michael Faraday *Google wikimedia*

Michael Faraday(1791-1867) discovered many laws of electricity, magnetism, light, and their interactions that provide the foundation for understanding space weather and heliophysics science. Portrait of physicist Michael Faraday by Thomas Phillips, 1842. Michael Faraday.

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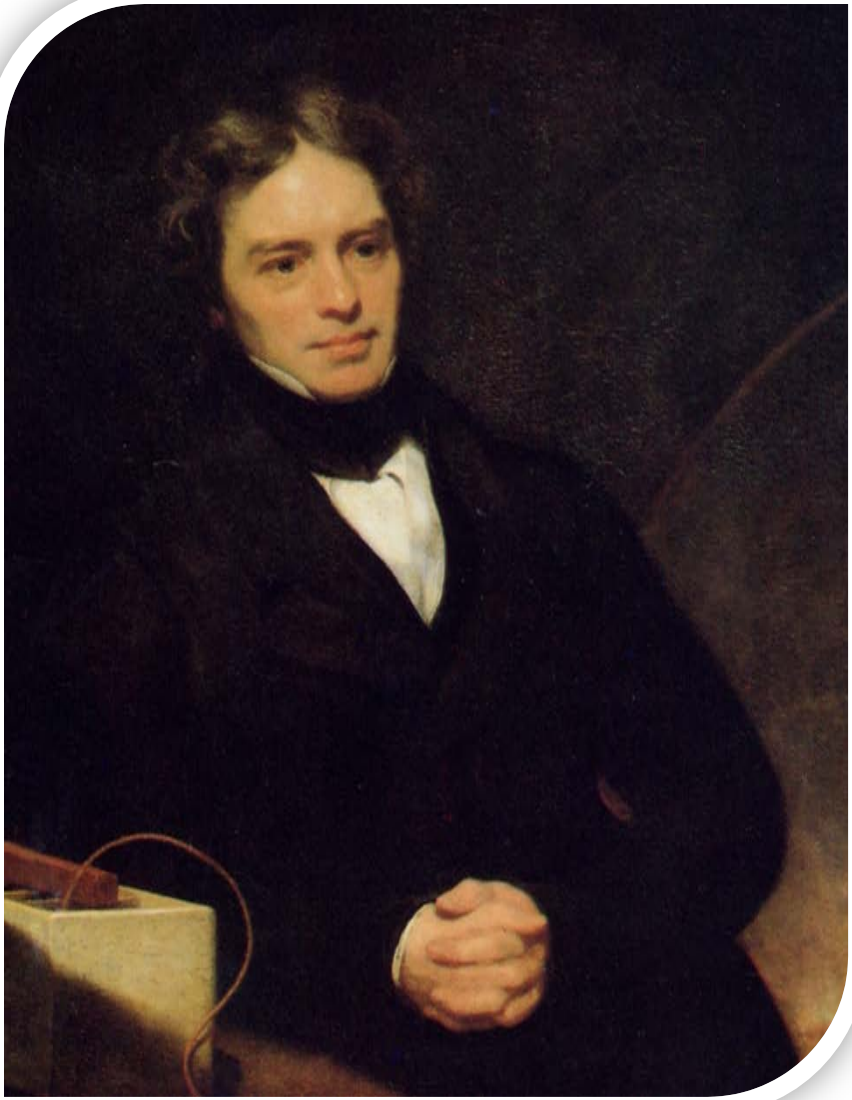
IMAGE CARD



DESCRIPTION CARD

Earth’s Magnetosphere

NASAscience.nasa.gov

A magnetosphere is that area of space, around a planet, that is controlled by the planet's magnetic field. The shape of the Earth's magnetosphere is the direct result of being blasted by solar wind. It prevents most of the particles from the Sun, carried in the solar wind, from hitting the Earth. The Sun and other planets have magnetospheres, but the Earth has the strongest one of all the rocky planets. The Earth's magnetosphere is a highly dynamic structure that responds dramatically to solar variations. Life on Earth developed and is sustained under the protection of this variable magnetosphere.

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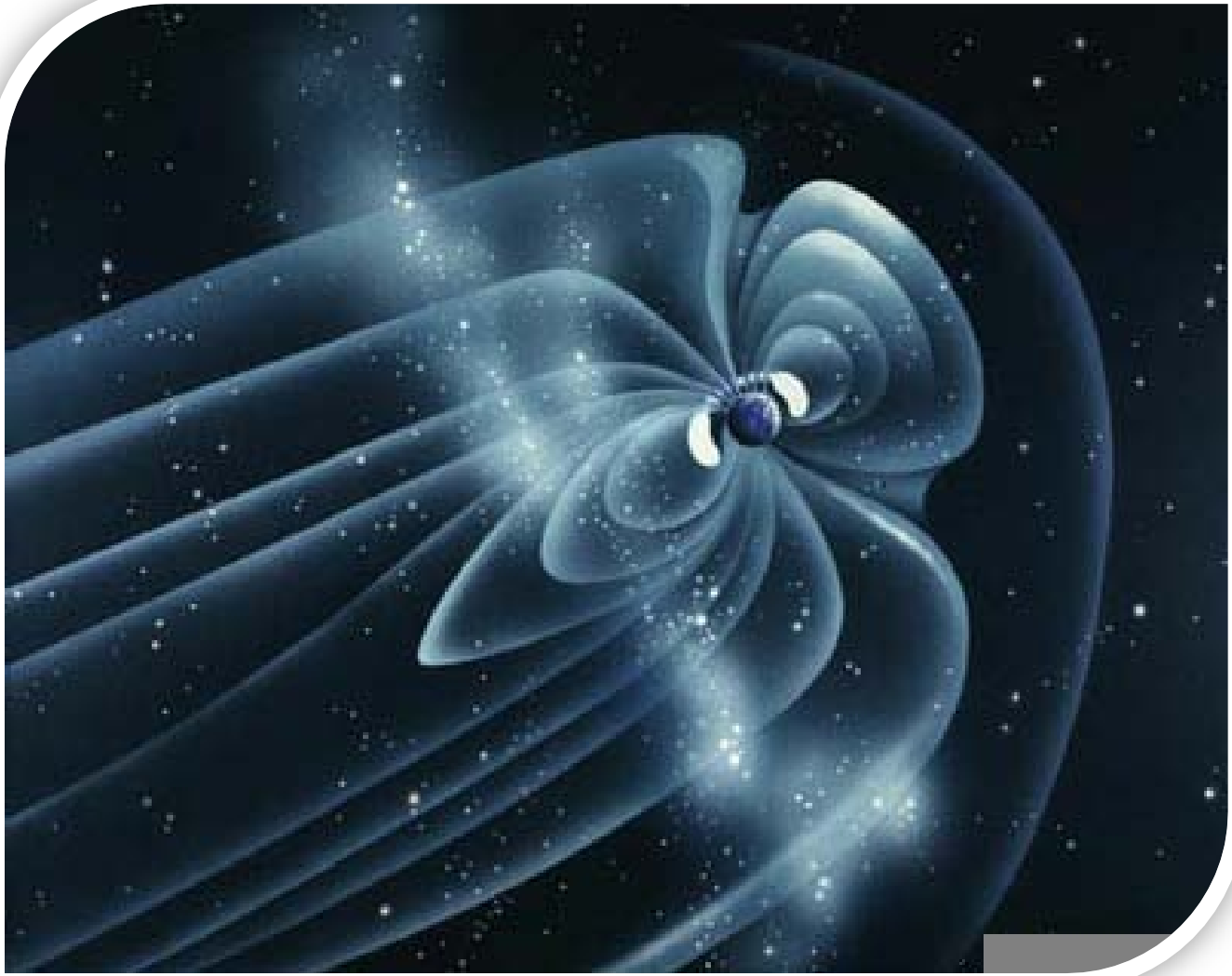
IMAGE CARD



DESCRIPTION CARD

Launch of Stereo *Stereo.gsfc.nasa.gov*

The twin STEREO (Solar TErrestrial RElations Observatory) spacecraft were launched Wednesday, October 25th, 2006 at 8:52 p.m. EDT on a Delta II 7925-10L rocket from Cape Canaveral Air Force Station in Florida.

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IMAGE CARD

DESCRIPTION CARD

Heliosphere *NASA*

We live in a giant bubble filled with electric and magnetic fields and atomic particles from the solar wind. This bubble, called the heliosphere encompasses all of the solar system and extends to over twice the distance to Pluto.

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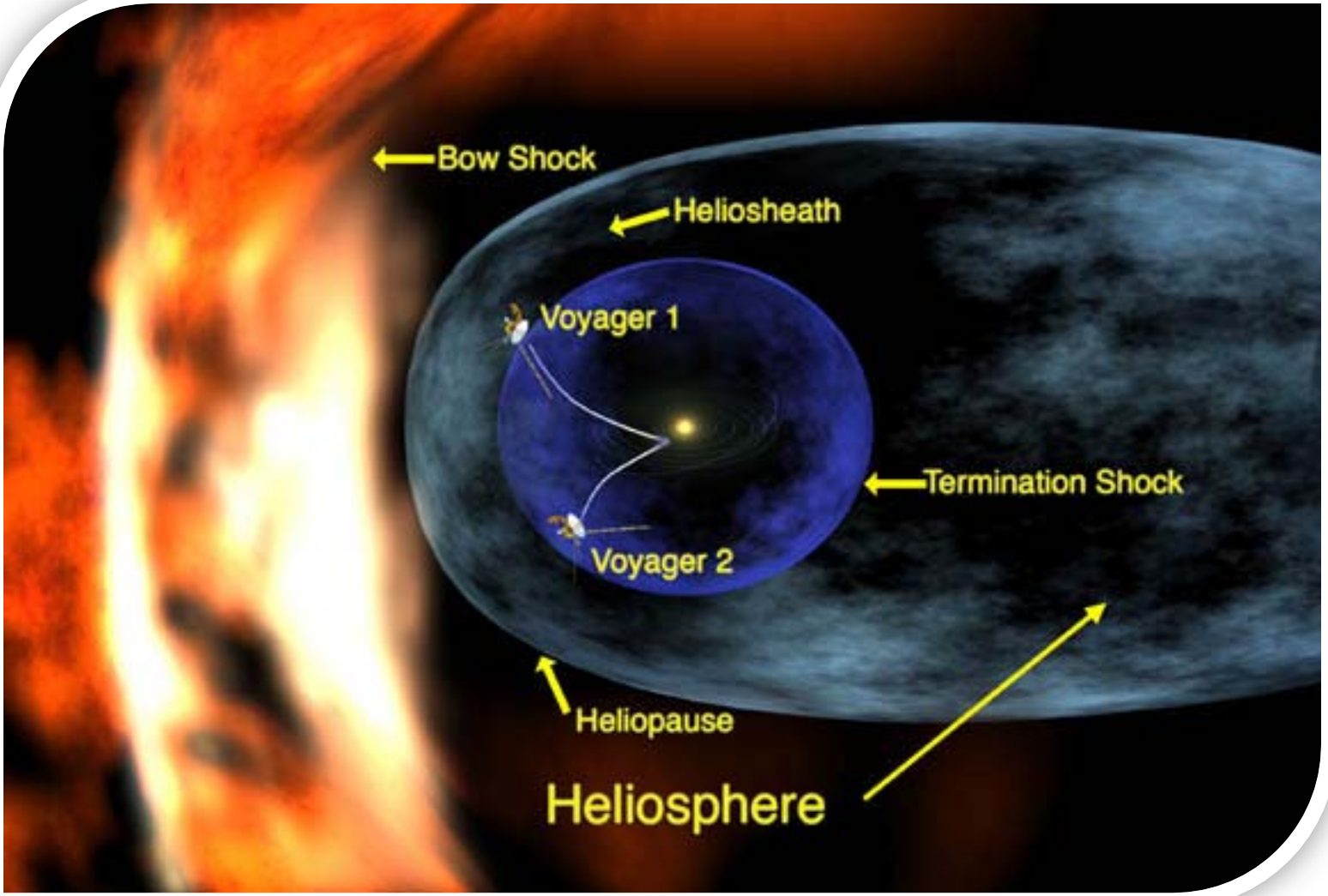
IMAGE CARD



DESCRIPTION CARD

Voyager Spacecraft *NASA/JPL*

The twin Voyager 1 and 2 spacecraft changed forever our understanding outer solar system and continue exploring where nothing from Earth has flown before. In the 30th year after their 1977 launches, they each are much farther away from Earth and the Sun than Pluto is and approaching the boundary region – the heliopause – where the Sun's dominance of the environment ends and interstellar space begins. Voyager 1, more than three times as distant as Pluto, is farther from Earth than any other human-made object and speeding outward at more than 17 kilometers per second (38,000 miles per hour). Both spacecraft are still sending scientific information about their surroundings through the Deep Space Network (DSN).

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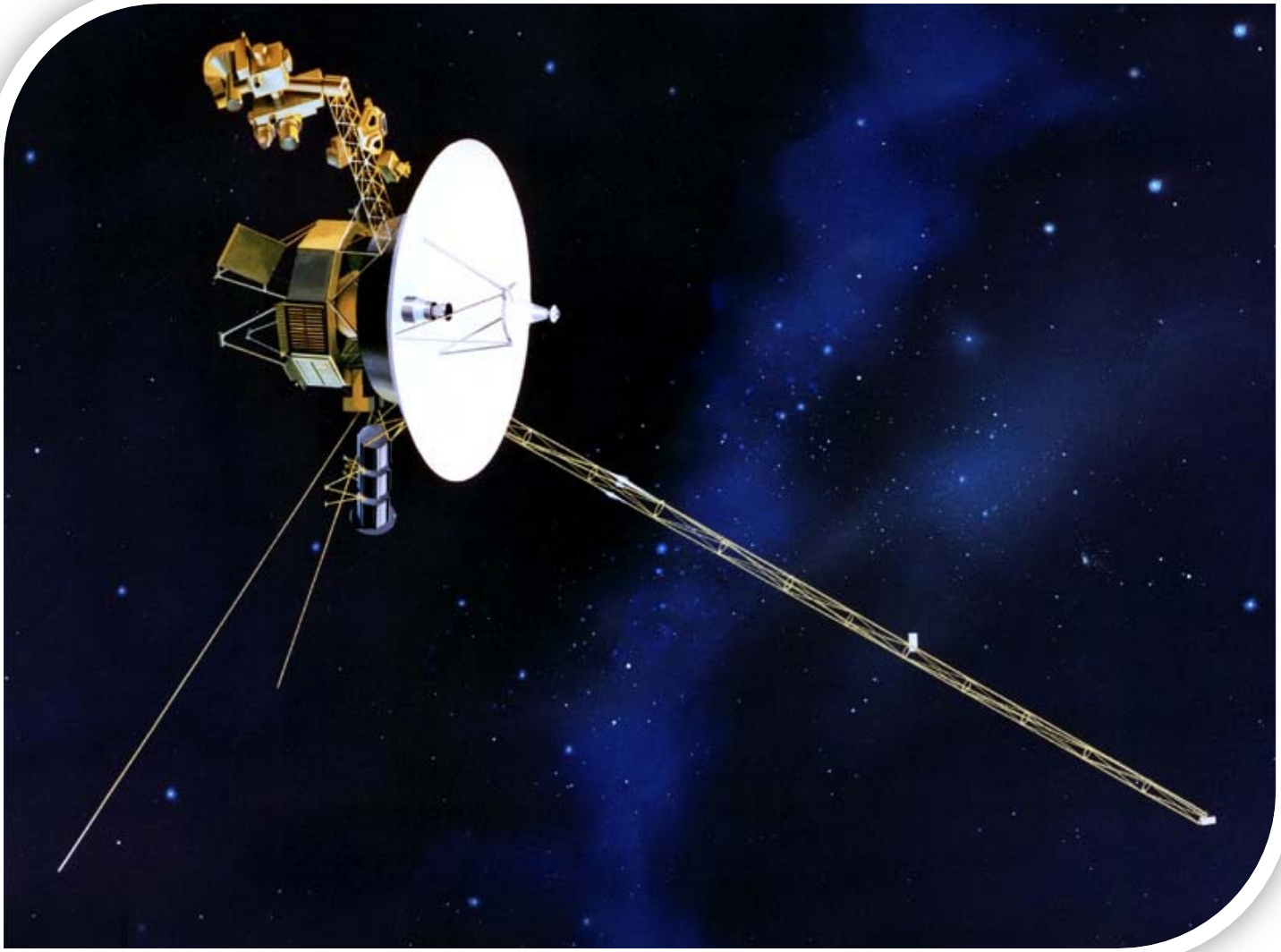
IMAGE CARD



DESCRIPTION CARD

Venus Transit *NASA/Lou Mayo*

The periodic crossing of the planet Venus across the disk of the sun provided astronomers, as far back as the 16th century, the opportunity to make crucial measurements of the size of the solar system through calculation of the Astronomical Unit. The next Venus Transit will occur on June 6, 2012.

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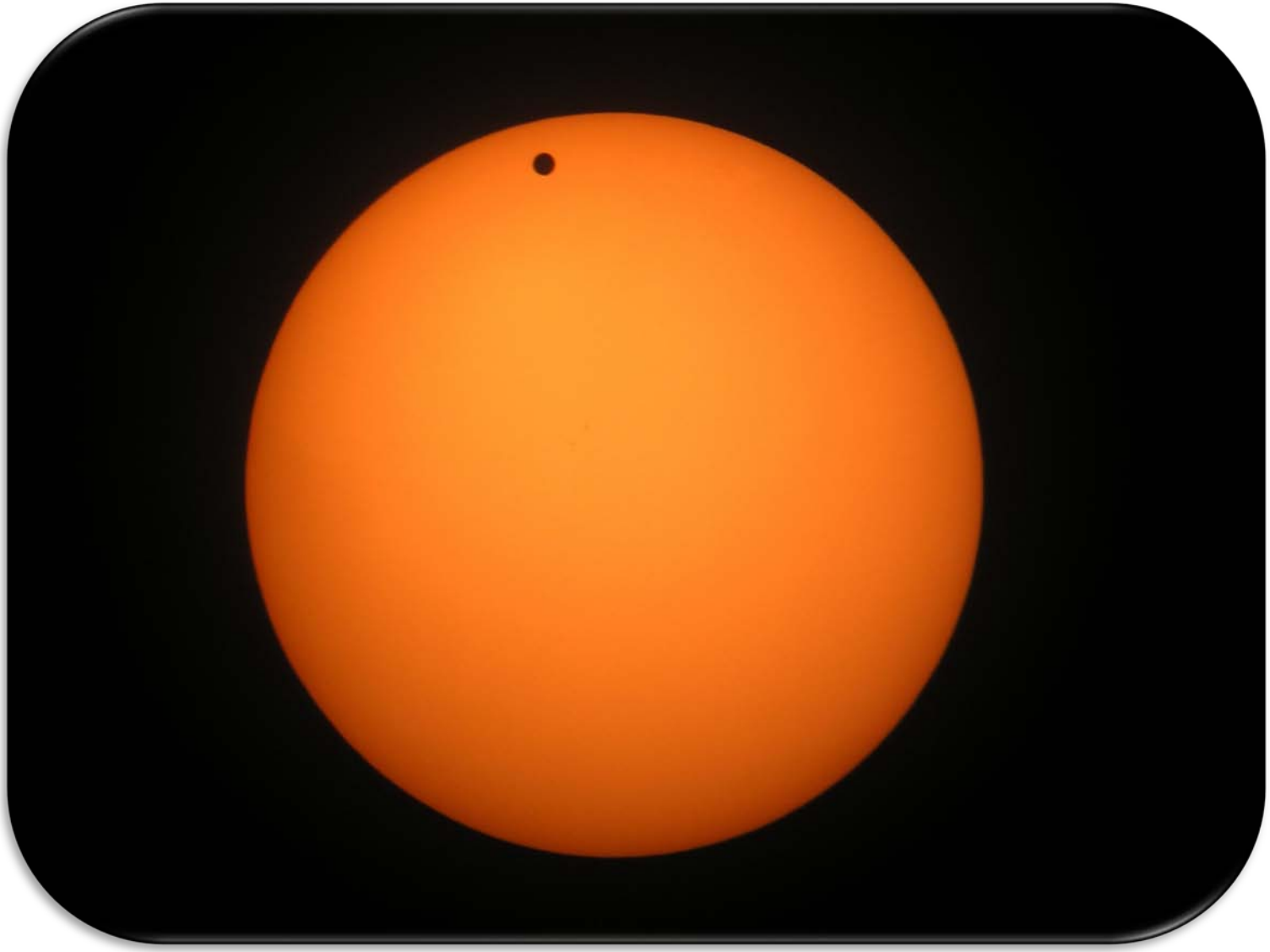
IMAGE CARD



DESCRIPTION CARD

Solar Wind *NASA*

The solar wind consists of atomic nuclei and electrons that streams off of the Sun in all directions at speeds of about 400 km/s (about 1 million miles per hour). The source of the solar wind is the Sun's hot corona. The temperature of the corona is so high that the Sun's gravity cannot hold on to it. Although we understand why this happens we do not understand the details about how and where the coronal gases are accelerated to these high velocities.

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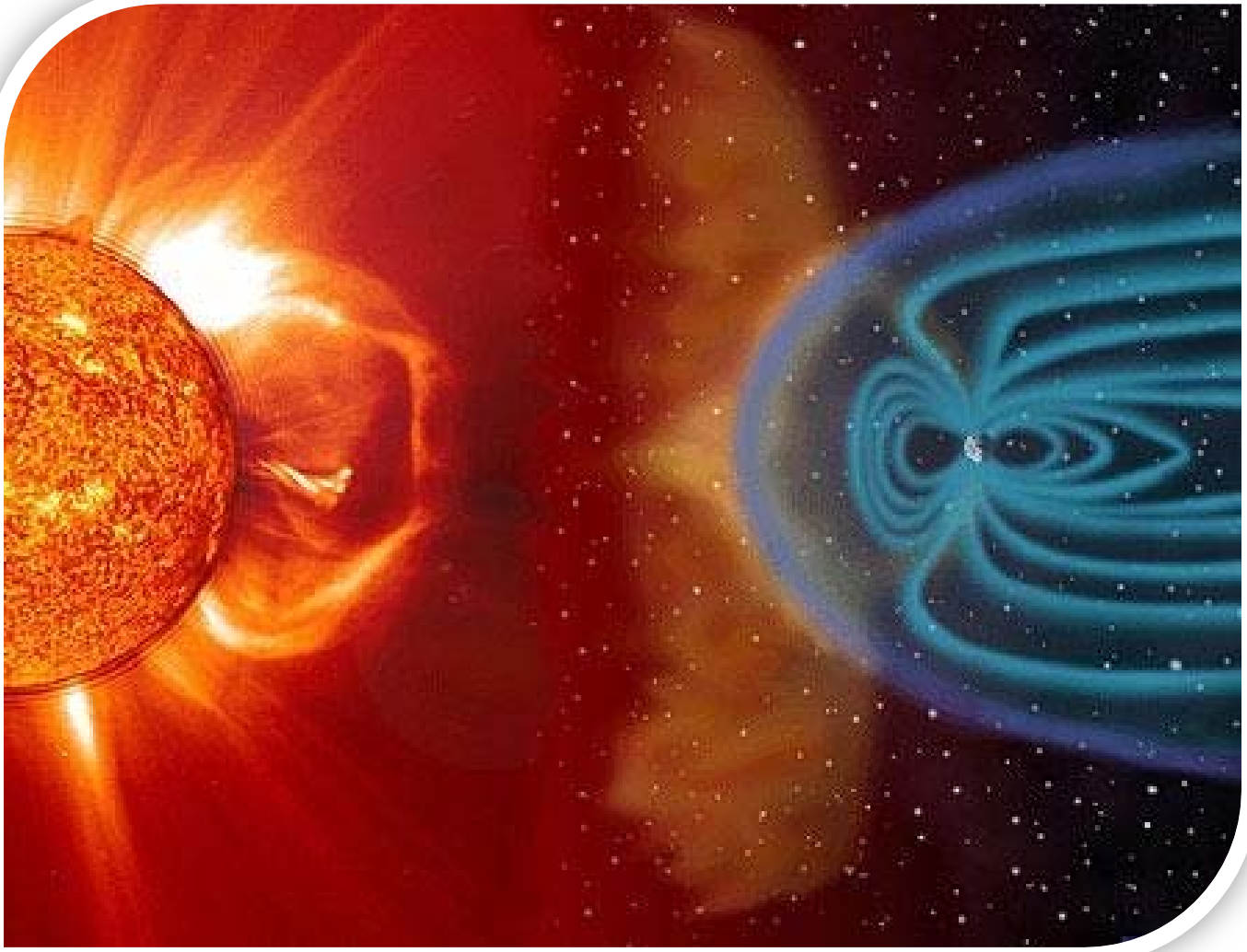
IMAGE CARD

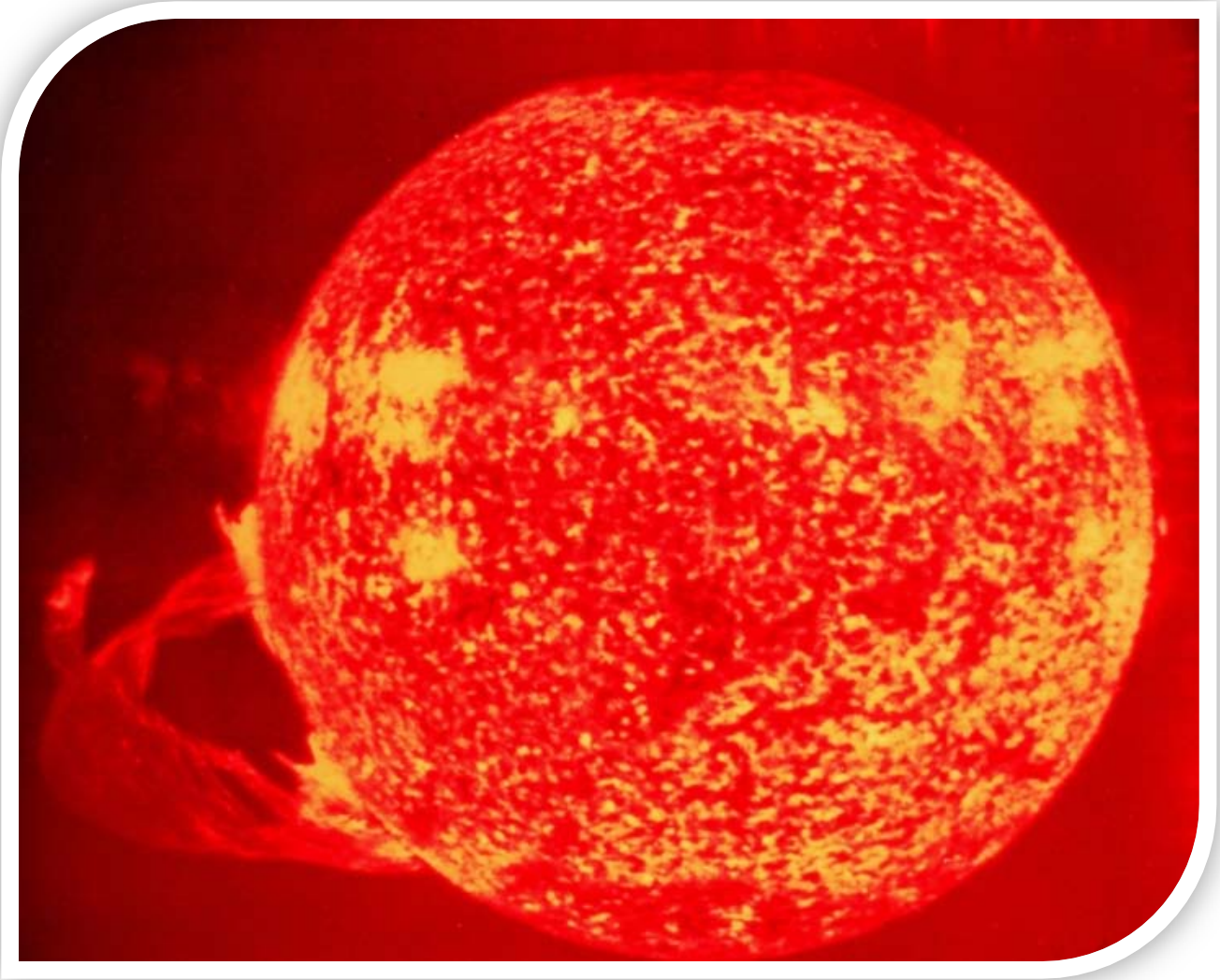


DESCRIPTION CARD

Solar Flare *NOAA*

A flare is defined as a sudden, rapid, and intense variation in brightness. A solar flare occurs when magnetic energy that has built up in the solar atmosphere is suddenly released. Radiation is emitted across virtually the entire electromagnetic spectrum, from radio waves at the long wavelength end, through optical emission to x-rays and gamma rays at the short wavelength end. The amount of energy released is the equivalent of millions of 100-megaton hydrogen bombs exploding at the same time!

IMAGE CARD



DESCRIPTION CARD

Noctilucent Clouds

NLCs are made of tiny ice crystals 40 to 100 nanometers wide—just the right size to scatter blue wavelengths of sunlight. They appear throughout the polar summer, are widespread, and are highly variable on hourly to daily time scales. The question is, What is ice doing in a rarefied layer of Earth's upper atmosphere that is one hundred million times dryer than air from the Sahara desert?

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IMAGE CARD

DESCRIPTION CARD

Sunspots *NASA*

Sunspots were first viewed by Europeans in 1610 when Galileo viewed the sun through his small refracting telescope. They are dark, relatively cool, and highly magnetic blemishes on the sun's surface (photosphere) that are often associated with violent solar storms.

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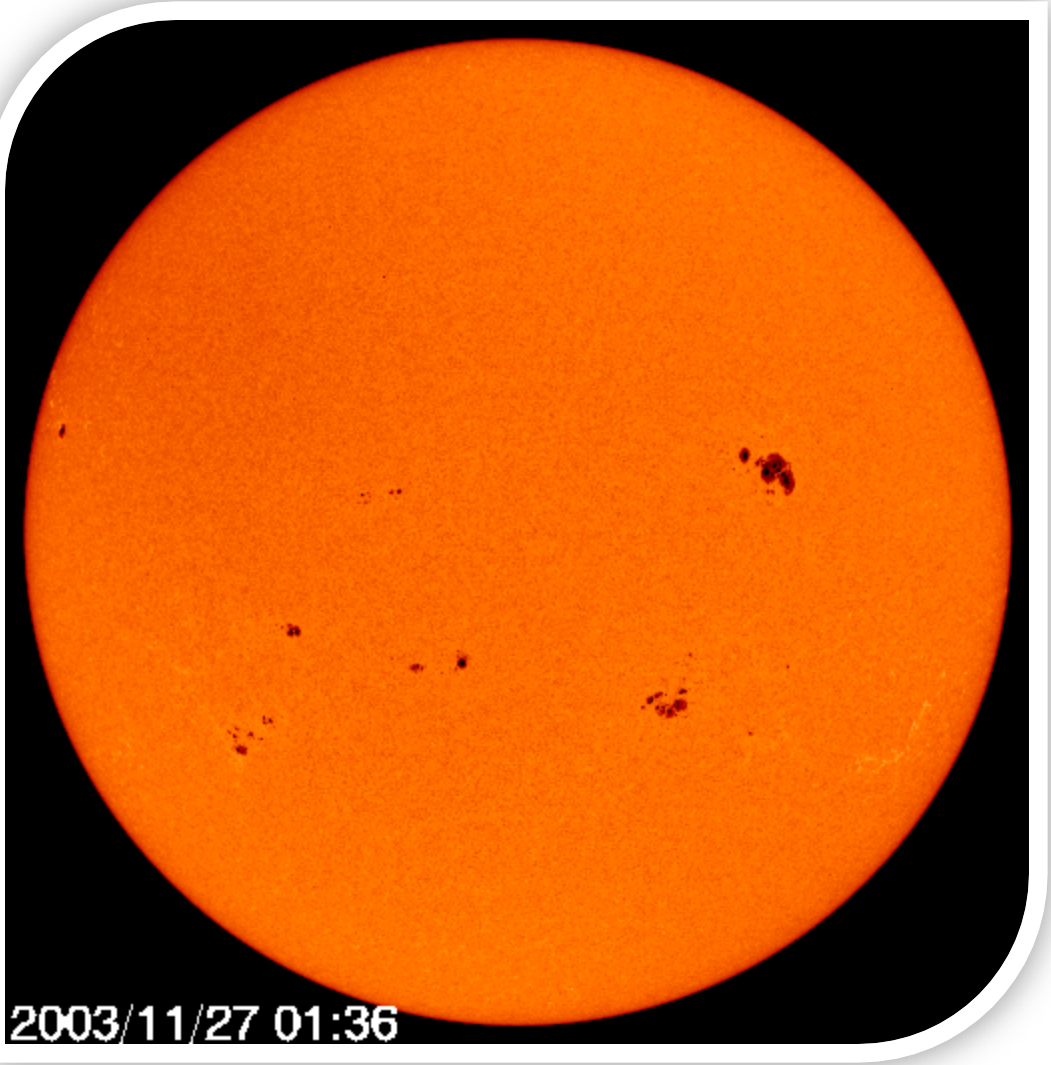
IMAGE CARD



DESCRIPTION CARD

Total Solar Eclipse *NASA*

A total solar eclipse occurs when the moon passes directly in front of the sun. Those lucky enough to be in the path of totality, or umbral shadow, will see the sun's beautiful corona glowing at over a million degrees centigrade.

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IMAGE CARD

DESCRIPTION CARD

Human Space Flight (ISS) *NASA*

The International Space Station (ISS) is the most complex machine ever devised. It serves as a laboratory for microgravity experiments and could someday be a platform for launching missions to the moon and Mars.

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IMAGE CARD

DESCRIPTION CARD

Jovian Magnetosphere *Penn State University*

What's the largest thing in the solar system? Nope, it's not the sun. It is Jupiter's magnetic field. Jupiter has the largest and magnetosphere of any of the planets. At its cloud tops, the field is 10 times stronger than the Earth's. It stretches out past the orbit of Saturn and is so big, the sun itself could easily fit inside.

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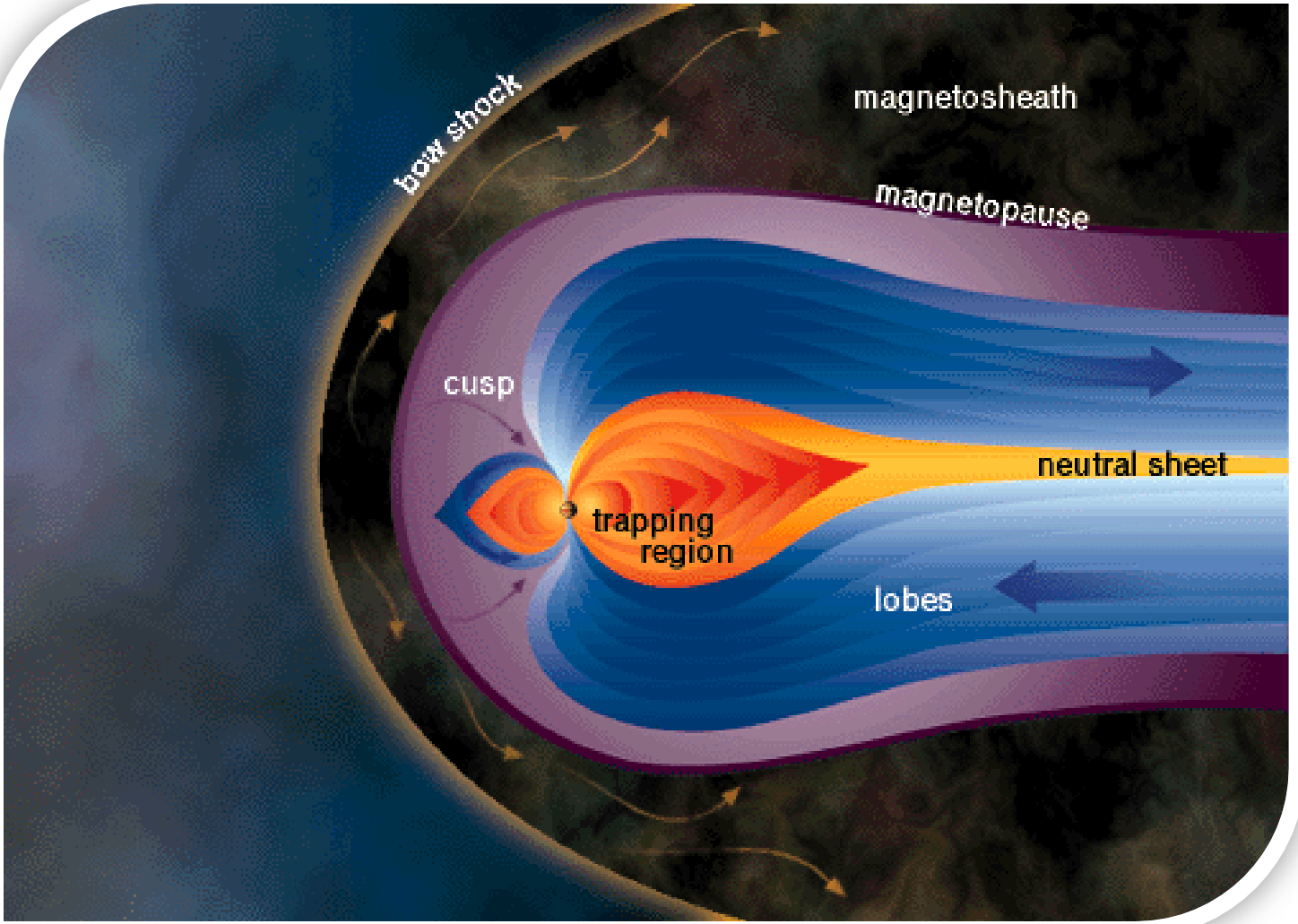
IMAGE CARD



DESCRIPTION CARD

Mars MGS Surface Magnetic Field *NASA*

The Mars Global Surveyor (MGS) magnetometer detected these magnetic field signatures in the Martian surface. These fields, frozen into the cold Martian crust are testimony that Mars once had a global magnetic field much as the Earth does today. The field probably shut off when its dynamo or internal electro-magnet cooled and froze out.

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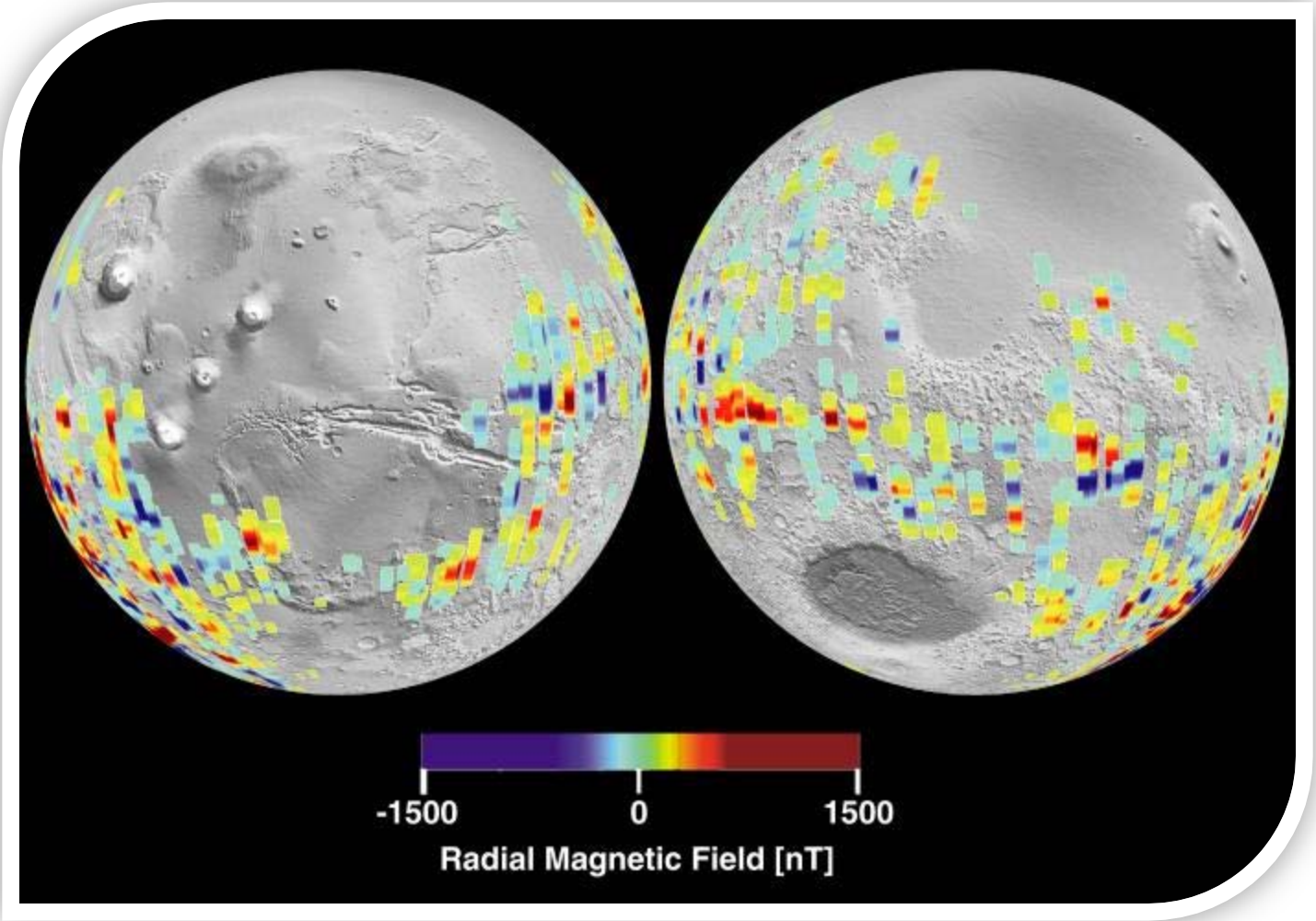
IMAGE CARD



DESCRIPTION CARD

Northern Lights (from Alaska) *NASA/SECEF*

Northern (and Southern) lights or aurora borealis and aurora australis are naturally occurring light shows that take place in Earth's atmosphere above about 80km. They are caused by collisions between electrons and protons trapped in Earth's magnetosphere colliding with nitrogen and oxygen atoms in the thermosphere – the most upper regions of the atmosphere.

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IMAGE CARD

DESCRIPTION CARD

Van Allen Radiation Belts *NASA/IMAGE*

First detected in 1958 by James Van Allen, these are two regions of particle (mostly electrons and protons) radiation trapped within the Earth's magnetosphere above about 4,000 miles.

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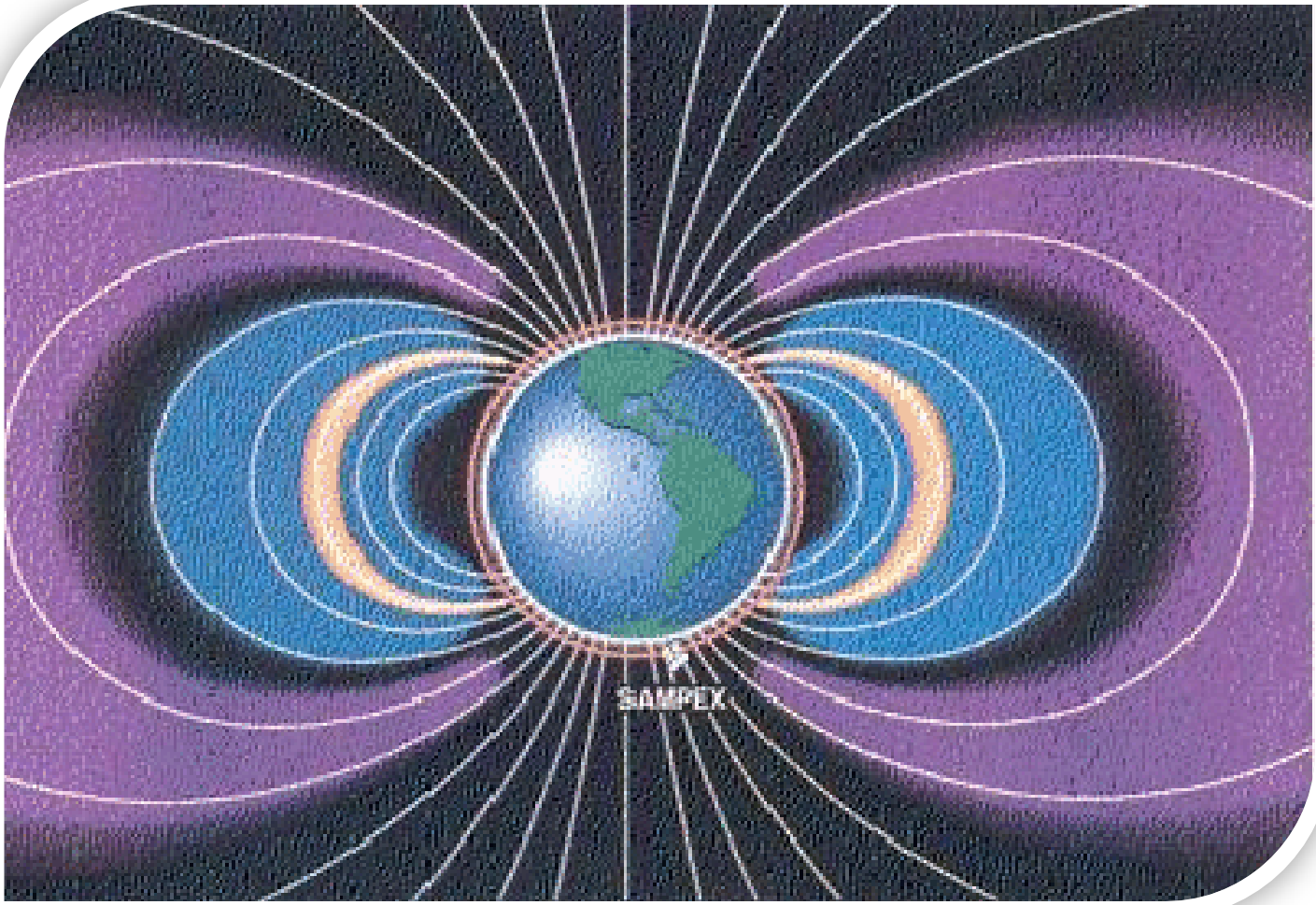
IMAGE CARD



DESCRIPTION CARD

Surface of Io *NASA*

The surface of Jupiter's inner most moon, Io is blanketed with volcanic material from deep within the moon. The material is composed of a number of sulphur compounds that, when exposed to solar radiation, turn the surface various shades of orange and red.

IMAGE CARD